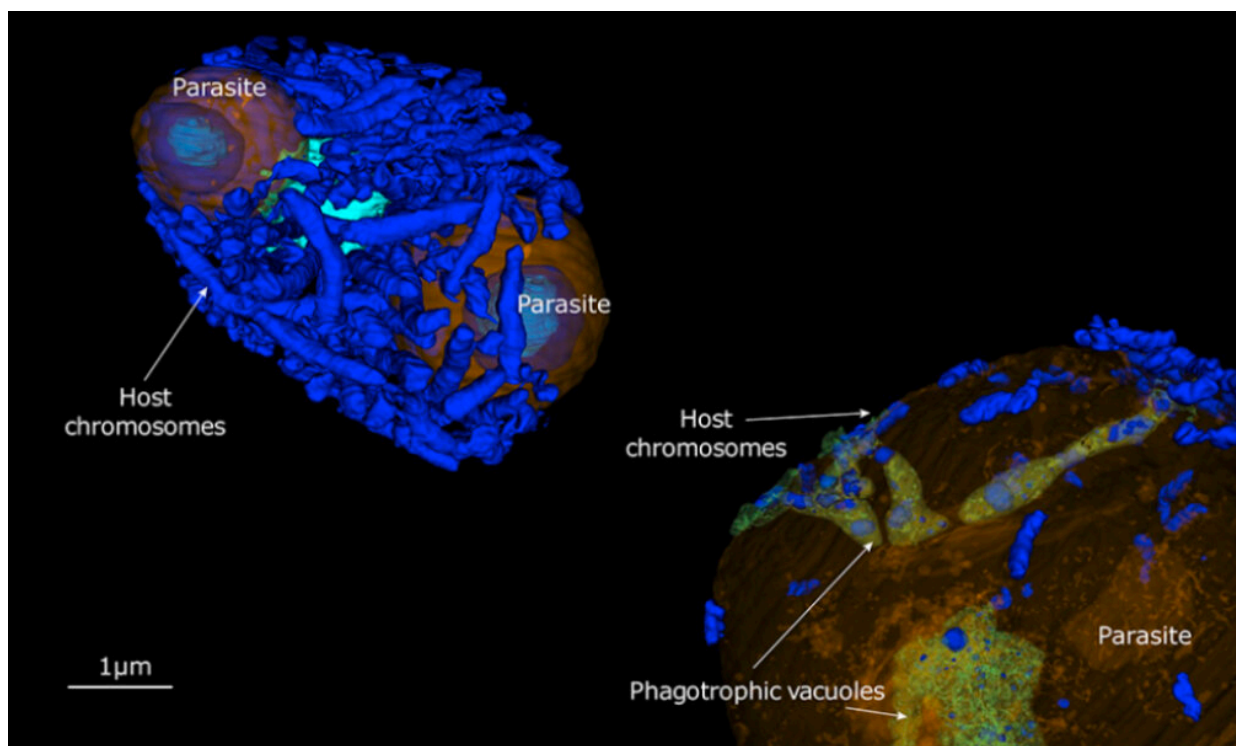


Plankton zombies: Intracellular development and impact of a marine eukaryotic parasite on its host

October 31 2022, by Ivy Kupec



Two parasites (their nuclei are visible in blue) invade the nucleus of a microalgal host that contains chromosomes (blue=genetic material). On the right is the later infection stage where the parasites start to engulf or swallow the host's chromosomes (blue) and digest them. Credit: Credit: Johan Decelle/CNRS

It's a tale as old as time. A parasite feeds on another species, taking what

it needs and eventually leaving a host-organism corpse in its wake.

One might think in the world of microalgae, this doesn't even occur, or that parasites there feast on an entire single-celled organism because it doesn't seem like a very big meal. But, alas, that is not necessarily the case. And in this research story, we learn about one plankton hijacking another plankton's energy, metabolism, and maybe even [genetic material](#)—all while victims are still alive.

EMBL scientists in the Schwab group studied this topic as part of a research project led by Johan Decelle's group and Laure Guillou, at CNRS in Grenoble and the Roscoff marine station, respectively. As more researchers have worked to characterize and understand ocean parasites in the past decade, these scientists focused on better understanding planktonic relationships—specifically, a strain of parasitic Amoebozoa and its microalgal host *Scrippsiella acuminata*.

In July, the scientists published findings from their recent research involving 3D electron microscopy combined with transcriptomics. The latter can identify a parasite's genes and pathways and how they respond to stimuli, including when they are in the midst of overtaking a phytoplankton's nucleus to hijack energy-producing processes.

Yes, that is what happens to *S. acuminata*, a single-celled microalgae known as a dinoflagellate, when it's invaded by the parasite Amoebozoa. *S. acuminata* isn't necessarily an innocent bystander in this story either. Many dinoflagellates—including both the parasite and host in this case—are associated with 'red tides', [harmful algal blooms](#) that cause far-reaching environmental and human health consequences.

Amoebozoa is a parasite but also another kind of dinoflagellate. Much like a [virus](#), one or more will enter the *S. acuminata* cells while the unsuspecting host continues to swim around in its water world as if

nothing has changed, even as *Amoebophyra* devours its nucleus. Remarkably, *S. acuminata* continues swimming and photosynthesising as the parasite actively overtakes energy-producing cells in the host's nucleus.

Next, the parasite begins replicating within this single-celled host, generating more [parasites](#) that will eventually depart to find their own hosts and begin this process anew, embarking on their own parasitic conquests. The *S. acuminata* [host](#), however, eventually dies—a slightly different outcome than something in *Zombieland*. Undead plankton apparently don't yet seem to exist.

And while this makes for a good Halloween story, the science does serve a greater purpose.

"This research is really just the start of shedding light on what's happening in the wider ecosystem," Decelle said. "With this type of 3D microscopy, we could observe a process going on inside the nucleus, step by step at nanoscale resolution. Now, it's a matter of deciphering the mechanisms and seeing where these small activities have implications on a much bigger scale—the environment in which they live."

The research was published in *The ISME Journal*.

More information: Johan Decelle et al, Intracellular development and impact of a marine eukaryotic parasite on its zombified microalgal host, *The ISME Journal* (2022). [DOI: 10.1038/s41396-022-01274-z](https://doi.org/10.1038/s41396-022-01274-z)

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